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CS-499: Computer Science Capstone

5-2 Milestone Four: Enhancement Three: Databases

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The artifact I selected for my database enhancement is an integrated Animal Shelter Management System that includes modules for managing records for animals in an animal shelter’s database. This application was originally created during Client-Server Development coursework, but relied on pre-integrated backend data structures and basic CRUD queries. For this enhancement I focused on refactoring and extending the system to use MongoDB independently of it’s pre-configured state in apporto, applying a normalized data model that follows third normal form principles, and building a more robust CRUD functionality for each entity.

I chose to include this artifact because it is highly representative of my professional experience in database systems. As a junior data engineer currently working with veterinary patient information system conversions, this artifact closely mirrors real-world workflows involving structured data transformation and integration into cloud-based platforms. The enchancements showcase my ability to connect applications to MongoDB using the mongosh shell, implement modular service layers, normalize complex datasets, and enforce secure, validated intractions with a NoSQL database. I also began to integrate the system with artifact 1, which will enable the appointment app to update adoption records and insert animal data using the java application’s Swing GUI.

I successfully met the course outcomes I planned to address in module 1. I demonstrated the ability to program solutions for managing and securing database operations while applying innovative design strategies to ensure modularity, scalability, and data integrity. I do not have any major updates to my outcome-coverage plans, as the enhancements I implemented align well with the original scope and objectives I set out to meet.

The enhancement process was both educational and professionally relevant. I learned a great deal about MongoDB schema design, including trade-offs of embedding versus referencing documents and how to structure indexes for fast, filtered lookups. A key challenge I faced was redesigning the original flat structure into a fully normalized schema without compromising the application’s usability.